

Technology Opportunity

Power System Analysis Capabilities

The National Aeronautics and Space Administration (NASA) seeks to transfer power system analysis computer programs developed through the Space Station development program.

Potential Commercial Uses

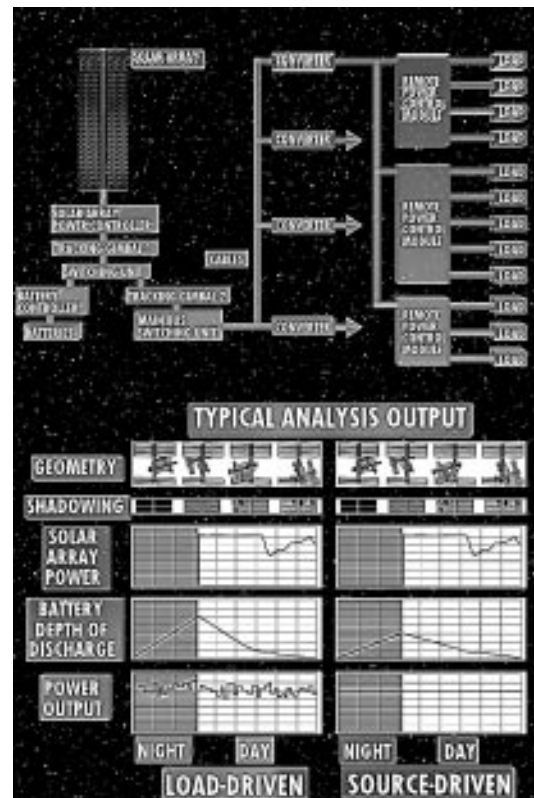
- A modularized computer software package to perform generic or specialized power system design, analysis, simulation and modeling
- A tool to design, analyze, optimize, and develop power systems for ground, air, or space applications by using components such as solar arrays, batteries, flywheels, or solar dynamic units
- Extend the computer programs to accomplish advanced applications such as
 - “Smart” power systems with electrical load prediction; fault/failure prediction, detection, and diagnosis; and autonomous power management/distribution control
 - Reliability, availability, and operations cost/resource utilization analysis
- Power system analysis enhancement to satellite orbit analysis and coverage software
- Network analysis computer software used to analyze resistive losses and voltage drops in large, hierarchically connected power distribution networks

Benefits

- Represents a synthesis of over 8 years of power system analysis expertise, software development, validation, and verification
- Performs detailed, integrated performance analysis of power systems to determine optimum power capability and operation
- Reduces the time required to design, develop and optimize power systems
- Provides an automatic graphical data display and presentation-quality plotting/printing of analysis results

The Technology

Capabilities have been developed by a team of experienced power system analysts to assess the performance, management, and operation of complex, integrated power generation and distribution systems. These power systems operate with many time-varying, complexly distributed electrical loads under cyclic conditions such as those encountered during Earth-orbital sunlight and eclipse cycles. This collection of computer programs was developed by the Power System Project Office as part of the International Space Station development program.



In order to perform a comprehensive power system analysis, these computer programs integrate many key power system attributes and hardware models. First, the software integrates many individual power system component models into an overall power system model. Secondly, numerous interrelated power system parameters and factors (thermal effects, geometric modeling and shadowing analysis, orbit mechanics information, hardware operation, distributed load variation, system control/simulation, and system optimization) are assessed within the computer program. By integrating the analysis of each of these factors, the software reduces analysis time, automatically synthesizes results, and adequately reflects the operation of the system.

The software can calculate the maximum power that the power system is capable of providing while optimizing the energy storage (a source-driven analysis), or it can determine how the power system must be operated (specifically, the energy storage system) in order to meet a fluctuating power system load demand (a load-driven analysis).

These computer programs have been used throughout the Space Station design process (since 1989). They have been thoroughly tested, debugged, and updated to ensure their accuracy. Moreover, this software has been validated against results from independently developed contractor-proprietary software.

Other computer programs developed at the Power Systems Project Office include software to

- Perform secondary power system distribution analysis on hierarchically connected networks
- Facilitate, test, and manage multiuser software development
- Create presentation-quality plots of two- and three-dimensional data that can be sent to a printer or displayed on the computer screen
- Perform reliability, operations cost, lifecycle cost, and logistics analysis
- Perform hybrid electric vehicle analysis
- Perform solar dynamic system design and analysis
- Analyze solar dynamic concentrator mirror design

Options for Commercialization

The power system analysis capabilities, tools, and related computer programs described herein were developed at the Power Systems Project Office (PSPO) at NASA Lewis Research Center in Cleveland, Ohio. These computer programs are available for further development and commercialization by license under a NASA Space Act Agreement. PSPO seeks industrial partners to cooperatively develop additional applications for this software and to utilize this software to analyze new and different power systems. Space Act Agreements to work on specific power system projects can be set up with industry, business, and academia. PSPO will not provide funding for the development of any commercial software, but will consider various levels of PSPO manpower expenditure, depending on the type of work, funding reimbursement (i.e., either by direct funding or by licensing royalty), the requirements of other projects, and/or synergy with other projects. Work can involve reimbursable computer program development and power system analysis, design, and development. If your company is interested in licensing the power system analysis computer programs or pursuing any of the commercialization options described herein, please contact us.

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Key Words

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